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PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in or relating to Induction Apparatus, more particularly for Electro-therapeutics.

I, Paul Bischofberger, of Centralstrasse 28, Lucerne, Switzerland, a citizen of Switzerland, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

Induction current is largely used in electro-therapeutics. In order to make it more bearable, it has been already suggested to make use of sinusoidal induction current. This invention relates to a change-over switch for induction current enabling an improved sinusoidal induction current to be obtained as it renders possible a better flattening of the current curves.

The invention comprises a change-over switch for alternately connecting the halves of the primary coil of an induction apparatus to a source of current by means of an armature rotatable about a middle axis and provided with a contact spring which is secured at a right-angle to it with its outer end lying between two contact screws, the said armature being arranged in front of the poles of a pair of electro-magnets, one electromagnet being in circuit between one of the said contact screws and one end of the primary coil of the induction apparatus, the other electro-magnet being in circuit between the other contact screw and the other end of the primary coil, the armature and its contact spring having a permanent electrical connection to one pole of the source of current, the other pole of which is connected to a central point of the primary coil.

In the accompanying drawing—

Figure 1 is a longitudinal section,

Figure 2 is a plan,

Figure 3 is a front elevation, and

Figure 4 shows the diagram of connections in which, for the sake of clearness, the electro-magnets have been omitted.

To the insulating bedplate 1 is secured by bolts a non-magnetic frame 2, for instance of brass. On each of two vertical lugs 2*a* on said frame is suspended a two-coil electro-magnet 3, 4. The iron cores 5 and 6 of the upper and lower coils of the electro-magnets 3 and 4 respectively project through the lugs 2*a*, the cores 6 being provided with non-magnetic projecting pins 7. Between the electro-magnets 3 and 4 on the frame 2 is adjustably screwed a bracket 8 in which are mounted in alignment two vertical screws 9 and 10 which form pin bearings for the spindle 11 of a rotatable armature 12. The said armature which is secured to the oscillating spindle 11 forms a fly wheel mass and has two upwardly projecting poles 13 and 14 situated in front of the core ends 5 and 6 of the two electro-magnets. In front of the armature 12 and at right angles thereto is secured one end of a spring 15, the other end of which lies free between two contact screws 16 and 17. A spring 18, one end of which is secured to a lateral extension 20 of the armature 12, and the other end to a contact screw 19, tends always to turn the armature 12 so as to bring the spring 15 into engagement with the pin 17 as shown in Figure 2, the pole 13 however remaining out of contact with the pin 7. Moreover, there are also provided four contact or binding screws 21, 22, 23, 24. The electric connection of the single parts of this switch is as follows:—

The contact screw 19 is connected to one end of a source of current E such as a galvanic battery or an accumulator, so

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that current can flow through the spring 18, armature 12 and spring 15. The screw 17 is connected to the binding screw 22, and the screw 16 to the binding screw 23. The binding screw 24 is connected to one end of the primary coil P of the induction apparatus, and the binding screw 21 to the other end of the primary coil P, whilst the other end of the element E is connected to a central contact point of the primary coil P. The electro-magnet 4 is connected in between the terminals 24 and 22, and the electro-magnet 3 between the terminals 23 and 21.

The current passes therefore from the element E through the spring 18, the armature 12, the spring 15, contact 17 to the binding screw 22, energises the electro-magnet 4 and passes through the left hand side of the primary coil P back to the element E. Owing however to the energising of the electro-magnet 4, the pole 14 is attracted until it contacts with the pin 7, owing to which the spring 18 is stretched, and the spring 15 is caused to leave the screw 17 and contact with the screw 16. Owing to this change of position, the current from the element E will now pass through the spring 18, the armature 12, the spring 15, contact 16, electro-magnet 3, to the binding screw 21, and through the right hand half of the primary coil P back to the element E. Thus the electro-magnet 3 will be energised and therefore the armature 12 will be turned, with the co-operation of the spring 18, back to the position shown in Figure 2, and, after bending the spring 15, still further until the pole 13 strikes the point 7.

The armature is therefore a double-acting one, it is rotatably mounted in the centre on pin points, and not, as generally hitherto, made stationary with one end of a spring. It is true that in this case, as in known contact breakers, there is provided a spring 18 which acts on the armature; but unlike existing similar springs in change-over switches and the like, it has for its object to bring about the springing of the switch, but not to pull the armature away from the magnet.

The magnetic action produces in the fly wheel mass of the armature a certain torque which, through the fly wheel mass, is given a certain momentum. It is possible to assume that the flattening of the current curves is produced owing to the bending of the spring 15, with the assistance of the momentum contained in the fly wheel mass, extending the time during which the circuit remains closed beyond the switching over, owing to which the peaks or points of the curves are reduced. On the other hand, the opinion is justified that the flattening is due to the energising or magnetising of the primary coil, which takes place alternately, for as shown in the diagram, Figure 4, there are two primary half-coils A and B. If the spring 15 is in engagement with the contact screw 17, an increasing current will flow owing to the self induction through the half coil A and one coil 4 of the switch, up to a maximum value. This current produces however an increasing magnetic flux, for instance in the direction towards the half coil B. At the maximum strength of the current, the contact at 16 will be closed, and the electric current will now have to pass through the half coil B, also beginning from zero. This time however a magnetic flux will be produced in the opposite direction, so that it will balance that of the coil A which has not yet dropped to zero (flattening of the curve) and only then will rise, whereupon the same thing will be repeated.

By shifting the bracket 8, the distance of the armature from the electro-magnets can be modified, and the number of periods in the sinusoidal induction current altered.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A change-over switch for alternately connecting the halves of a primary coil of an induction apparatus to a source of current, characterised by an armature (for example 12), rotatable about a middle axis and provided with a contact spring (for example 15), which is secured at a right-angle to it with its outer end lying between two contact screws (for example 16 and 17), being arranged in front of the poles of a pair of electro-magnets (for example 3 and 4), one electro-magnet being in circuit between one of the said contact screws and one end of the primary coil of the induction apparatus, the other electro-magnet being in circuit between the other contact screw and the other end of the primary coil, the armature and its contact spring having a permanent electrical connection to one pole of the source of current (for example a battery E), the other pole of which is connected to a central point of the primary coil.

2. A change-over switch as set forth in

Claim 1, characterised by, when the switch is at rest, the contact spring of the armature being kept in contact with one of the two contact screws by a second spring (for example 18), thus ensuring the apparatus starting.

3. A change-over switch for induction apparatus substantially as described or substantially as illustrated in the accompanying drawing.

Dated this 19th day of January, 1921.

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Fig. 1

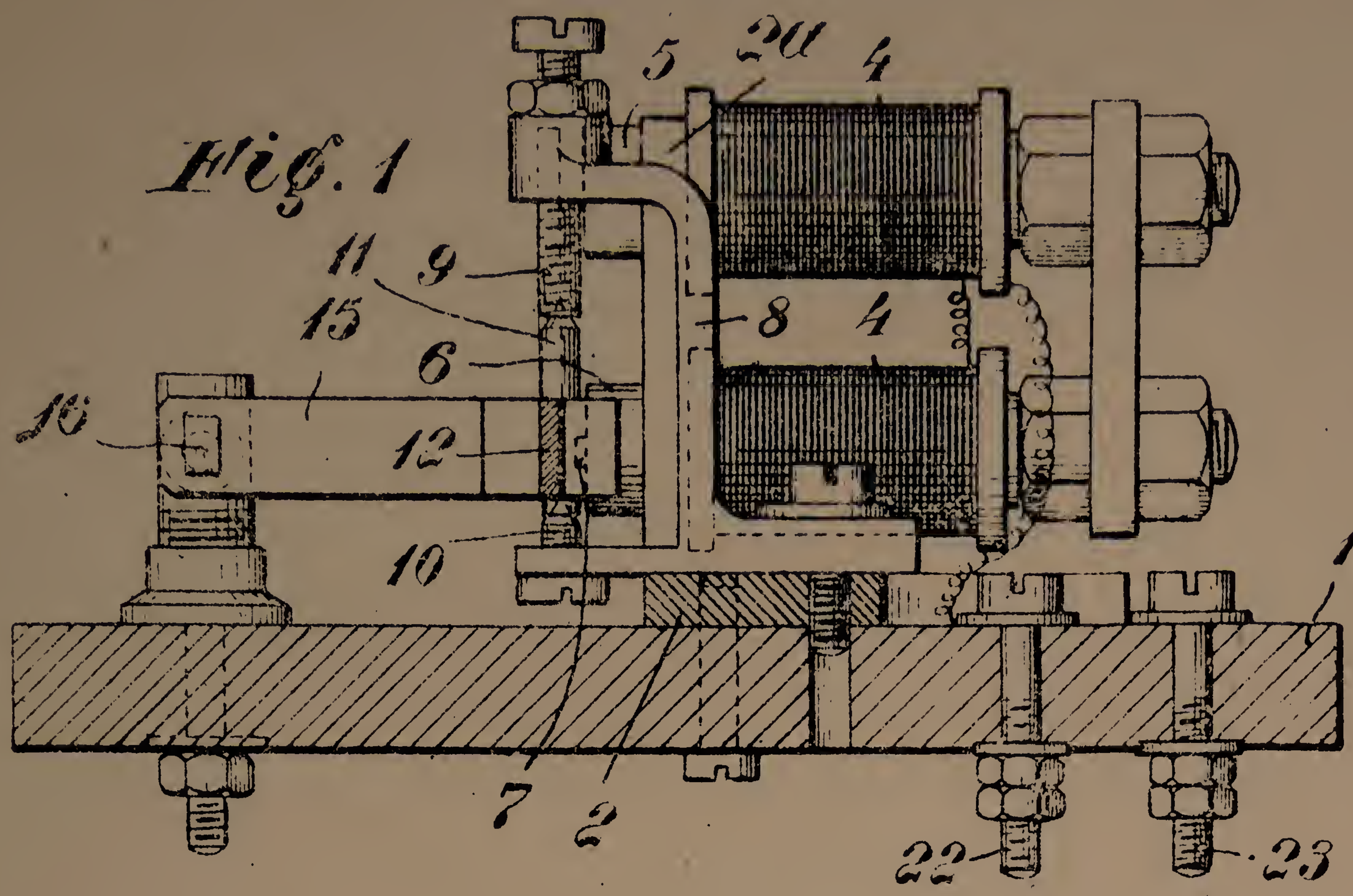


Fig. 2

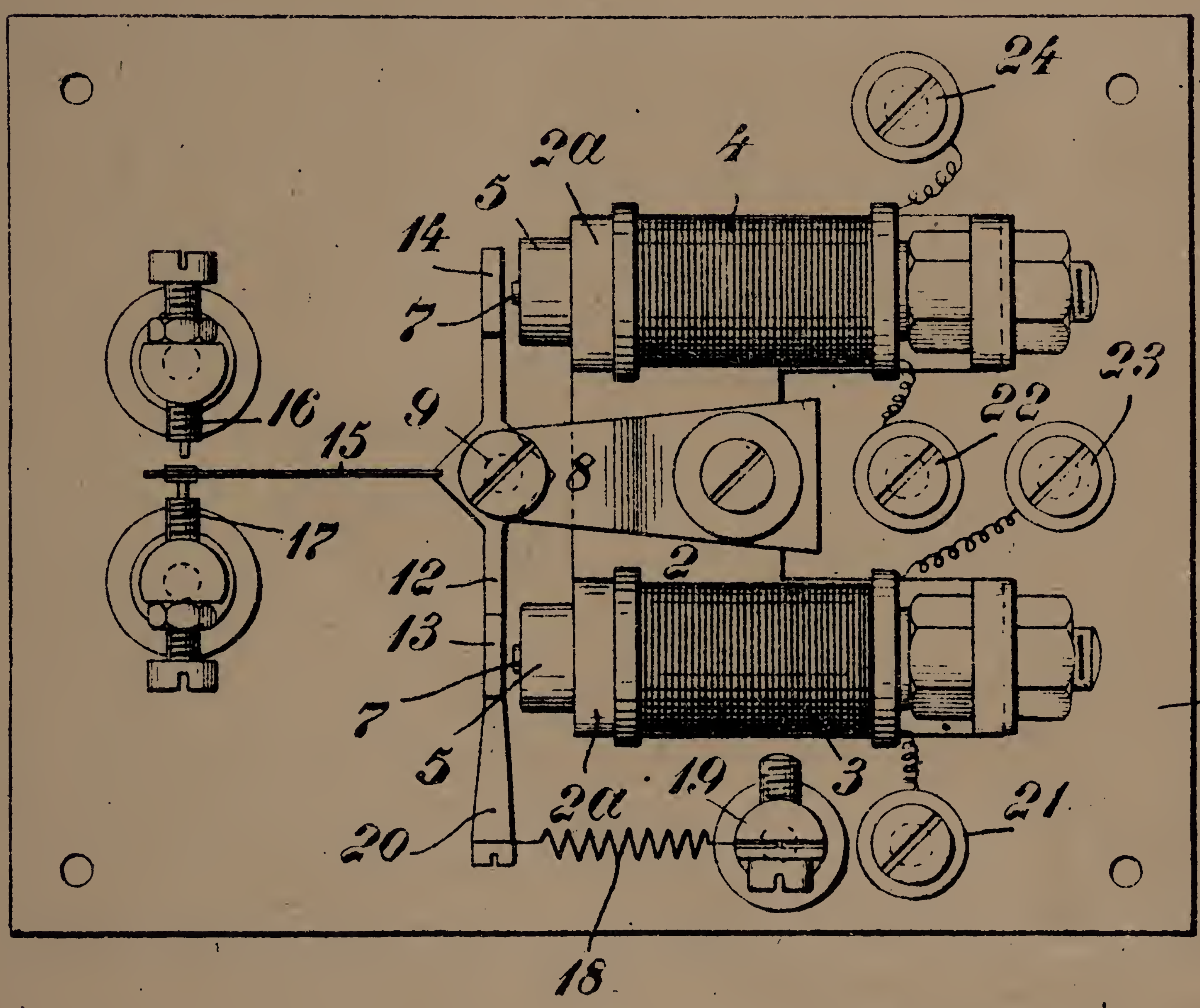


Fig. 3

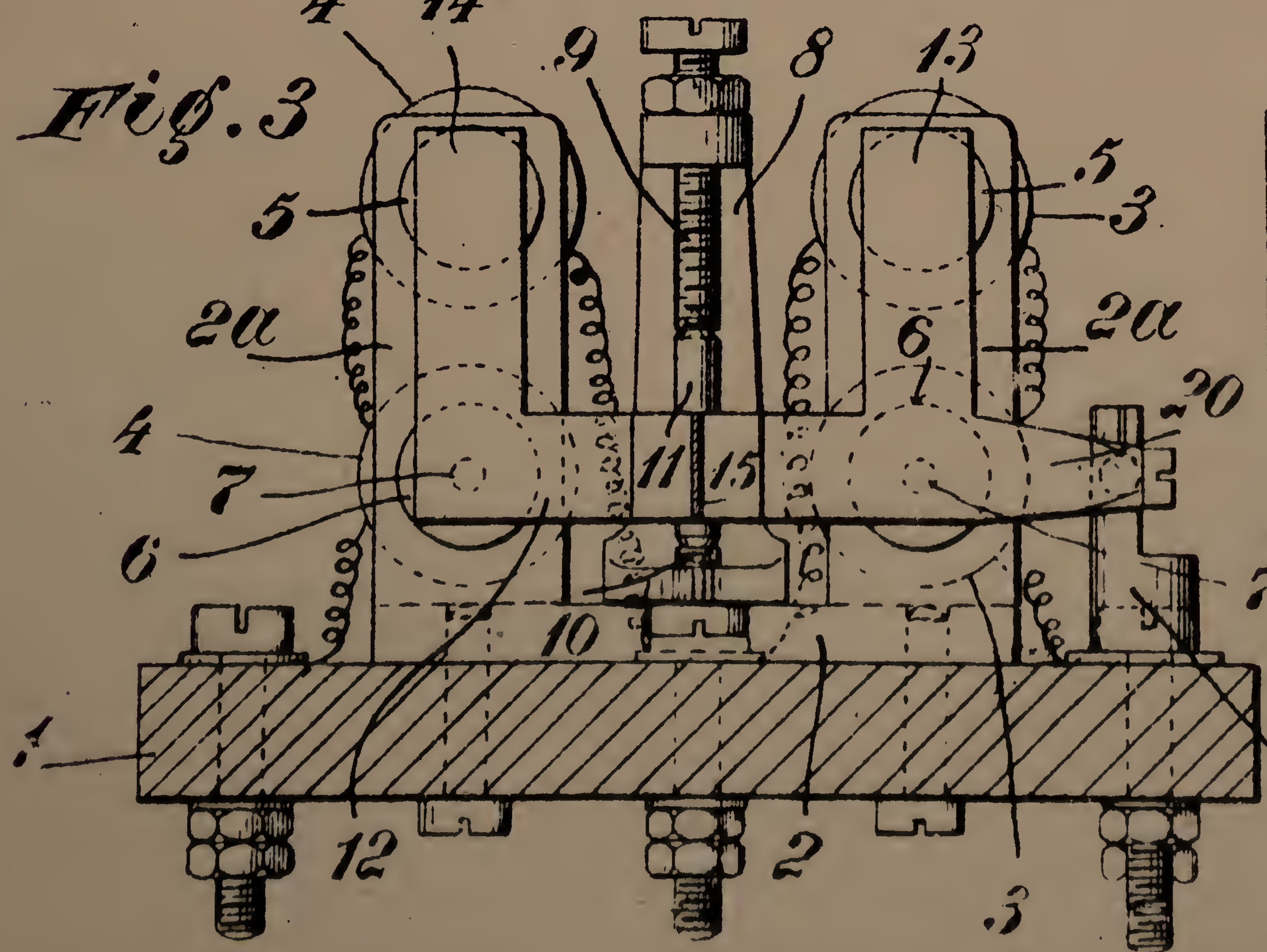
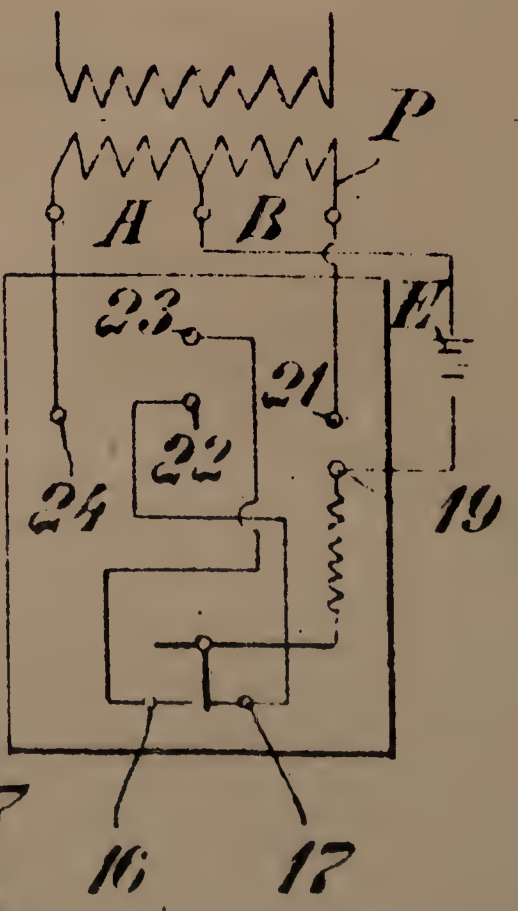


Fig. 4



[This Drawing is a reproduction of the Original on a reduced scale.]

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